

WHAT IS CLAIMED IS:

1. An apparatus comprising:

a first switch;

a first transformer comprising first primary windings and first secondary windings,  
5 the first primary windings coupled in series to the first switch;

a second switch;

a second transformer comprising second primary windings and second secondary  
windings, the second primary windings coupled in series to the second switch;

a control unit coupled to the first switch and to the second switch, the control unit to  
10 control the first switch and the second switch to enter a first state in which the first switch is  
closed and the second switch is open, and to enter a second state in which the first switch is  
open and the second switch is closed;

a first load coupled to an input node via the first switch in the first state and coupled  
to ground via the second switch in the second state, the first load to receive a first current;

15 a circuit coupled to the first secondary windings and to the second secondary  
windings; and

a second load coupled to the circuit, the second load to receive a second current  
substantially proportional to the first current.

20 2. An apparatus according to Claim 1, wherein a turns ratio of the first transformer  
is  $N$ , wherein a turns ratio of the second transformer is  $N$ , and wherein the second current is  
to be substantially equal to the first current divided by  $N$ .

3. An apparatus according to Claim 1, the circuit comprising:

a first diode, an anode of the first diode coupled to a first terminal of the first secondary windings; and

a second diode, an anode of the second diode coupled to a first terminal of the second secondary windings,

5            wherein a cathode of the first diode and a cathode of the second diode are coupled to the second load.

4. An apparatus according to Claim 3, the circuit further comprising:

10            a first resistive element coupled to the first terminal of the first secondary windings and to a second terminal of the first secondary windings; and

             a second resistive element coupled to the first terminal of the second secondary windings and to a second terminal of the second secondary windings.

15            5. An apparatus according to Claim 1, wherein the control unit is coupled to the second load, and wherein the control unit controls the first switch and the second switch based at least in part on the second current.

20            6. An apparatus according to Claim 5, wherein the first load is coupled to a voltage input of an integrated circuit.

7. An apparatus comprising:

             a voltage regulator converter to generate a supply voltage, the voltage regulator converter comprising a high side power transistor to generate a high side alternating current and a low side power transistor to generate a low side alternating current;

a current sensing circuit to generate a first alternating current based on the high side alternating current and to generate a second alternating current based on the low side alternating current;

5 a rectifier circuit to generate a substantially direct current based on the first alternating current and on the second alternating current; and

a resistive element to receive the substantially direct current, wherein a voltage drop across the resistive element is to be proportional to the supply voltage.

8. An apparatus according to Claim 7, wherein the current sensing circuit comprises:

10 a first transformer to receive the high side alternating current and to generate the first alternating current based on the high side alternating current; and

a second transformer to receive the low side alternating current and to generate the second alternating current based on the low side alternating current.

15 9. An apparatus according to Claim 8, wherein the first transformer comprises:

first primary windings to receive the high side alternating current and first secondary windings to carry the first alternating current,

wherein the second transformer comprises:

20 second primary windings to receive the low side alternating current and second secondary windings to carry the second alternating current,

wherein a turns ratio of the first secondary windings to the first primary windings and a turns ratio of the second secondary windings to the second primary windings are equal to  $N$ , and

25 wherein the voltage drop is to be substantially equal to the supply voltage divided by  $N$ .

10. An apparatus according to Claim 9, wherein the rectifier circuit comprises:  
a first diode to receive the first alternating current from the first secondary windings;  
and  
a second diode to receive the second alternating current from the second secondary  
5 windings,  
wherein a cathode of the first diode and a cathode of the second diode are coupled to  
the resistive element.

11. An apparatus according to Claim 9, wherein the current sensing circuit further  
10 comprises:  
a first resistive element coupled to a first terminal of the first secondary windings  
and to a second terminal of the first secondary windings; and  
a second resistive element coupled to a first terminal of the second secondary  
windings and to a second terminal of the second secondary windings.

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12. An apparatus according to Claim 7, wherein the rectifier circuit comprises:  
a first diode to receive the first alternating current; and  
a second diode to receive the second alternating current,  
wherein a cathode of the first diode and a cathode of the second diode are coupled to  
20 the resistive element.

13. An apparatus according to Claim 7, further comprising:  
a voltage regulator controller coupled to the resistive element, the voltage regulator  
controller to control the high side power transistor to generate the high side alternating  
25 current and to control the low side power transistor to generate the low side alternating  
current based at least in part on the voltage drop.

14. A method comprising:

generating a high side alternating current with a high side power transistor;

generating a low side alternating current with a low side power transistor;

5        generating a first alternating current based on the high side alternating current using  
a first transformer having a turns ratio of  $N$ ;

generating a second alternating current based on the low side alternating current  
using a second transformer having a turns ratio of  $N$ ;

10       generating a power supply current based on the high side alternating current and on  
the low side alternating current; and

generating a substantially direct current based on the first alternating current and on  
the second alternating current,

wherein the substantially direct current is substantially equal to the power supply  
current divided by  $N$ .

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15. A method according to Claim 14, further comprising:

controlling the high side power transistor to generate the high side alternating current  
and controlling the low side power transistor to generate the low side alternating current  
based at least in part on the substantially direct current.

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16. A system comprising:

a microprocessor;

a double data rate memory coupled to the microprocessor; and

25       a voltage regulator to provide a supply voltage to the microprocessor, the voltage  
regulator comprising:

a voltage regulator converter to generate the supply voltage, the voltage regulator converter comprising a high side power transistor to generate a high side alternating current and a low side power transistor to generate a low side alternating current;

5           a current sensing circuit to generate a first alternating current based on the high side alternating current and to generate a second alternating current based on the low side alternating current;

a rectifier circuit to generate a substantially direct current based on the first alternating current and on the second alternating current; and

10           a resistive element to receive the substantially direct current, wherein a voltage drop across the resistive element is to be proportional to the supply voltage.

17. A system according to Claim 16, wherein the current sensing circuit comprises:

15           a first transformer to receive the high side alternating current and to generate the first alternating current based on the high side alternating current; and

a second transformer to receive the low side alternating current and to generate the second alternating current based on the low side alternating current.

18. A system according to Claim 17, wherein the first transformer comprises:

20           first primary windings to receive the high side alternating current and first secondary windings to carry the first alternating current,

wherein the second transformer comprises:

second primary windings to receive the low side alternating current and second secondary windings to carry the second alternating current,

wherein a turns ratio of the first secondary windings to the first primary windings and a turns ratio of the second secondary windings to the second primary windings are equal to  $N$ , and

5        wherein the voltage drop is to be substantially equal to the supply voltage divided by  $N$ .

19. A system according to Claim 18, wherein the rectifier circuit comprises:

a first diode to receive the first alternating current from the first secondary windings;  
and

10        a second diode to receive the second alternating current from the second secondary windings,

wherein a cathode of the first diode and a cathode of the second diode are coupled to the resistive element.

15        20. A system according to Claim 16, the voltage regulator further comprising:

a voltage regulator controller coupled to the resistive element, the voltage regulator controller to control the high side power transistor to generate the high side alternating current and to control the low side power transistor to generate the low side alternating current based at least in part on the voltage drop.